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I.

ON DISINFECTION AND THE PRACTICE OF QUARANTINE; WITH SOME REMARKS AND COMMUNICATIONS RELATIVE TO CONTAGIOUS DISEASE, AND ESPECIALLY THE CHOLERA.

By ANDREW URE, M.D. F.R.S., &c.

WE have the pleasure of offering our readers, this day, the following able and peculiarly interesting extract from the Journal of the Royal Institution of Great Britain. We regret that it is not in our power to present the cuts, given in the Journal, of the apparatus of Dr. U. The exclusion of these has rendered necessary a few omissions and slight alterations of the text, which do not however affect in any way the sense of what is here given.

The remarkable power of chlorine, and of its officinal compounds, chloride of lime and soda, in decomposing and destroying the fetid effluvia of animal and vegetable bodies in a state of putrefaction, has been so long known, has been verified in so many instances, and is susceptible of such direct demonstration, as to be beyond the cavils of medical pyrrhonism in its most wanton mood. That these effluvia are capable of making morbid impressions on the living body, is also placed beyond any reasonable doubt, not only by the sickness

they instantly occasion, but by the many recorded cases of fevers of a putrid or low typhoid type, brought on by incautious exposure to masses of animal matter far advanced in putrefaction. The power of such matter to produce fevers by inoculation, has been often fatally exemplified in the dissecting schools; and the power of a lotion of chloride of lime or soda to counteract danger from such inoculation, is now equally well ascertained. In a letter just received from my son, at present House Surgeon of the Glasgow Royal Infirmary, he says, "Having performed several *post mortem* dissections of persons who have died from malignant fevers, dysentery with extensive ulceration of the mucous membrane of the large intestines, peritonitis with purulent effusion into the abdomen, hectic from suppuration, gangrene, &c., I have never suffered the slightest inconvenience. Yet these are the cases in which that peculiar animal poison is especially generated which has occasionally proved fatal to the demonstrator of disease. I attribute the immunity I have enjoyed, in a great measure, to my washing my hands immediately after each inspection with the chloro-sodaic liquor of Labarraque; this I prefer to the solution of chloride of lime, as it is not so apt to injure the skin.

"A young gentleman, who acted

as my colleague during part of last winter, but who did not adopt the above precaution, having imbibed through a minute breach of surface on his little finger a portion of this virus, was in a few hours thereafter attacked with acute inflammation of the absorbents of the arm, accompanied with high symptomatic fever, which confined him to his bed for many weeks, and required the most powerful antiphlogistic measures to subdue the inflammatory symptoms. I could cite instances of my predecessors having suffered from the same cause, but I deem it unnecessary, as the fact is indisputable."

A mournful example of the danger of putrefactive effluvia occurred a considerable time ago in the north of Scotland. Two young medical men, desirous of examining a body which had been interred without dissection, in consequence of the prejudices of the relations of the deceased, went in a very dark night to exhume it, but having mistaken the grave, laid open a coffin replete with such noisome corruption, that the gentlemen instantly sickened with the fetor, were hardly able to go home, where they forthwith took to bed with symptoms of malignant fever, and died. MM. Orfila, Leseure, Gerdy, and Hennelle, were employed, about seven years ago, in Paris, to examine the body of an individual who was supposed to have been poisoned, and who had been dead and buried for nearly a month. Had they rashly proceeded to the inspection, they would most probably have fallen victims to their imprudence; but the smell was intolerable, and the body could hardly be approached; they had, therefore, recourse to chloride of lime, sprinkling a solution of it over the putrid corpse, which produced, after a few asper-

sions, such a wonderful effect, that the nauseous effluvia were instantly quenched, and the dissection was performed with comparative comfort.

Chloride of lime has been repeatedly used since with equal efficacy in similar cases; it has become a familiar anti-putrescent agent in the anatomical theatre, and has been applied to destroy the stench of bilge-water and common sewers with unfailing efficacy. Its operation on fish so much tainted as to be hardly fit for the table, I have myself repeatedly tried, and I have found that a dish of such fish cleaned and opened up, by immersion in a dilute solution of the chloride for a few minutes, loses the dark color at the bone and all offensive scent; and after being washed in water, when boiled it possesses the curdy firmness, sea-air flavor, and taste, of newly-caught fish. An ounce of good chloride of lime is sufficient to sweeten a very large dish.

The phenomena of putrefactive fermentation seem to show that the fetor resides in certain hydrogenated compounds, containing carbon, sulphur, phosphorus, azote, &c.; for gaseous matter of this kind is eventually disengaged in the larger cavities of the trunk, as well as in the cellular tissue, causing a general intumescence. There is every probability, likewise, that the diffusible fomes of contagious disease resides in some analogous compounds, but of so subtle a nature as hitherto to have baffled every effort of chemistry to collect and analyze. The same thing may be said of the miasmata of marshes. The infectious virus of plague, smallpox, and putrid bodies, resembles in some measure the poisonous secretion of venomous reptiles, and is of a more durable composition and less vola-

tile (so to speak) than the effluvia of typhus, scarlatina, and measles. We can therefore easily understand why an agency capable of decomposing the former morbid powers, may be feeble to grapple with the latter, embodied as they are in a too palpable humor or a solid crust.

Guyton Morveau appears to have been the first man of science who directed the resources of pneumatic chemistry in a regular manner to the purpose of disinfection. The Cathedral of Dijon had been for several years infested with a febrile fomes or miasma, which occasioned fever in many of its pious visitants, and it had become in consequence nearly deserted as a place of worship. Being then (1774) Professor of Chemistry in the Academy of Dijon, M. Guyton was naturally induced to exercise his science in expurgating the air of the church. He accordingly filled the whole capacity of the building with muriatic acid gas, disengaged from a mixture of salt and sulphuric acid distributed in a number of stoneware dishes. The doors and windows were kept close for two or three days, to prevent the dissipation of the acid fumes. At the end of this period a free ventilation was given by opening the doors and windows, after which the church was found to be deprived of its unpleasant smell and unwholesome effluvia.

In 1796, Dr. Carmichael Smith applied the fumes of nitric acid, disengaged from nitre by sulphuric acid, to the disinfection of a ship's hospital, for which he received a considerable parliamentary reward.

Since that time the progress of chemical research has made us more fully acquainted with the intense affinity which exists between

chlorine and all hydrogenated compounds, and with the resulting antiputrescent quality of chloride of lime. Hence chlorine has naturally come to be regarded as the most energetic antiloinic agent. In this respect, likewise, the merit of its introduction belongs to M. Guyton, who recommended medical men, nurses, and other attendants on contagious disease, to carry about with them phials containing manganese and muriatic acid, and to open the glass stopper from time to time in situations replete with infectious effluvia, in order that the chlorine exhalations might decompose them, and preserve a healthy atmosphere for respiration. In the sequel of the present paper, facts will be adduced apparently proving the efficacy of this antidote to the contagion of cholera.

As gaseous chlorine in the state in which it is evolved from muriatic acid and manganese, has been thought to be too concentrated for diffusing in apartments occupied by the sick, recourse has been had in a great variety of cases to the exhalations that spontaneously rise from chloride of lime exposed in an extensive surface, either in its pulverulent form or dissolved in water. It is true, indeed, that under both of these forms the chloride exhales its peculiar odor, but it gives out no appreciable or operative portion of gas, and instead of losing, it gains weight. I have suspended a piece of moist litmus paper within three inches of good chloride of lime, in a stoppered phial, for upwards of an hour, without its being blanched; nay, the paper retained much of its color at the end of twenty-four hours. As the paper would have become white in a few minutes by the admission to the phial of one-tenth of a cubic

inch of chlorine gas, it is obvious that even that minute volume was not disengaged from the chloride, which amounted to nearly 500 grains. But by the agency of muriatic acid, that quantity of the said chloride would have evolved about 145 grains, or 190 cubic inches of pure gas. I may remark, that few samples of the bleaching powder found in the market are impregnated like the above with fully 29 per cent. of chlorine, and the stuff retailed in many shops under that name seldom contains more than 16 per cent. As for the liquid chloride of lime, the two-shilling bottles occasionally possess no more virtue than would be found in two-pennyworth of Messrs. Tennant's dry bleaching salt. Nothing, therefore, can exceed in absurdity the fashionable nostrum for disinfecting apartments charged with contagious fomes, by placing in them one or more saucers filled with chloride of lime. To place this dangerous fallacy in the plainest light, I need merely state that moist litmus paper may be hung for a day a very few inches above such a saucer, without perceptibly losing color; whereas the affusion of a few drops of muriatic acid on the same chloride, even after the above period, will instantly blanch the suspended paper.

It has been supposed that the carbonic acid present in the atmosphere displaces the chlorine from the lime; but how slowly and insignificantly, the preceding experiment may show. The following facts have been long before the medico-chemical world. "After passing a current of this gas (carbonic acid) for a whole day through the chloride diffused in tepid water, I found the liquid still to possess the power of discharging the co-

lor very readily from litmus paper."*

Chloride of lime laid out in the air passes rapidly into a deliquescent paste, consisting of muriate of lime, and lime with an obscure displacement of oxygen. If the chloride be surcharged with chlorine, it speedily gives off the excess and becomes commercial chloride. The best manufacturers, aware of this circumstance, never push the impregnation beyond a certain pitch; in which state the chloride does not spontaneously emit in the air one-thousandth part of its condensed chlorine. To pretend, therefore, to suffocate the hydra of contagion by subjecting it to the simple smell of chloride of lime in a saucer, is just such a mockery as it would be to appease the famished stomach by the smell of a cook-shop. The subtle effluvia of a pestilence must be combated by more energetic means; they must be environed with an atmosphere of chlorine adequate to their destruction. Everything short of this consummation is paltering with the safety, not of a few individuals, but possibly of a nation.

But I shall be asked, whether chlorine gas can be diffused through the air of a chamber without injuring the lungs of living beings, as well as the furniture and goods? I answer, Yes, when it is distributed on philosophical principles. But I might ask the medical practitioner in return, whether the corrosive sulphuric and nitric acids may be administered internally? Yes, he would be ready to reply, when sufficiently diluted; and the same answer will serve for chlorine. I

* On the Manufacture and Composition of Chloride of Lime, by Dr. Ure, Quarterly Journal of Science and the Arts, for July, 1822.

have been a frequent inmate of manufactories of chloride of lime on the greatest scale, and I have occasionally found the atmosphere, in certain departments of the works, to be impregnated, in a sensible degree, with chlorine gas. Moist litmus paper would have speedily lost its color in such an atmosphere, although dyed woollen and calico stuffs, in the dry state, suffered no perceptible change. The workmen who habitually respired this chlorified air experienced no evil effects on their health, nor, indeed, any inconvenience at all, unless an accident befel some joint of their apparatus. These facts prove the safety of immersion in chlorine largely diluted with air, yet still strong enough to blanch moist litmus paper; which may be regarded as a satisfactory criterion of its activity when directed against contagion.

In applying chlorine gas to apartments, we should always bear in mind, that it is one of the heaviest of elastic fluids, and therefore it tends to occupy the lower region in preference to the upper. If, in the little cave near Naples, called the *Grotto dei Cani*, the carbonic acid adheres closely to the floor, so that, by rising hardly above the knee, a man continues to breathe in perfect ease, unconscious of the presence of his invisible foe, while the dog at his foot is instantly suffocated, we may judge how much more closely a stratum of chlorine should adhere—a gas nearly double in density to carbonic acid; for air, carbonic acid, and chlorine, are in specific gravity respectively as 2, 3, and 5. We need not be told that chlorine, like other gaseous matter, has the faculty of diffusing itself slowly upwards through atmospheric air; but this is only

when it has nothing else to do, for when it encounters substances on which it can exercise its pre-eminent affinities, it will combine with them, probably to *their* destruction, and certainly to its own, as an *influential* gas. In proof of this position, I have many experiments to adduce, one of which was exhibited before the Marquess of Lansdowne, Sir Henry Hallford, and the whole Board of Health in the Royal College of Physicians, on Friday evening, the 24th of June. Having had the honor, two evenings before, to submit to that Board a plan for disinfecting the cargoes of ships, by distributing dilute chlorine through their holds by an apparatus, doubts were strongly, and very naturally expressed by many members of the Board, as to the penetrability of dense bales of hemp, wool, and cotton, by the chlorine gas. I was asked, whether I could satisfy them on this head by an experiment; and if so, how soon. I undertook to make the experiment in two days; but an anxiety being shown to have it tried the next day, I promised to do my endeavor, with such apparatus as I could command. Accordingly, on the 23d of June, at four o'clock, P. M., miniature bales of hemp, wool, and cotton, were made up as dense as possible, the latter two being moreover inclosed in thick canvass bags. They were all put into a tall glass cylinder, open at top, the hemp being placed at the bottom. Chlorine was now introduced through a glass tube, which descended beneath the middle of the jar. In the centre of each parcel, a bit of moist litmus paper was placed before it was bound up. Next evening, at nine o'clock, the Board having met again, the little bales were opened, and the papers in their centres were

rendered snow-white, clearly proving the penetration. The external fibres of the hemp parcel were so corroded by the chlorine as to be easily torn asunder; while the fibres of the canvass bags, placed above, were not in the slightest degree affected, nor the wool and cotton within them. I have since found that pure chlorine is pretty quickly absorbed by unbleached hemp, with the extinction of the peculiar pungent smell of the gas; but that dilute chlorine, blown through among its fibres, will blanch moist litmus paper enclosed in a compact bale, without impairing the tenacity of the hemp in the slightest degree. If merely so much chlorine be introduced without agitation, through a tube, into a vessel, as to fill its lower half where a hemp package lies, the gas will not spontaneously mount to the upper half, but will concentrate and expend its energies on the organic fibres below. In like manner, if chlorine be made to exhale from capsules placed on the floor of a still apartment, containing beds and other furniture, the gas will be arrested in its diffusive ascent, and will never reach in adequate force the upper walls or ceiling to which the hot effluvia of contagious pyrexia (as typhus, scarlatina, small-pox, &c.) naturally rise. Should the walls of the apartment have been recently washed with milk of lime, the gas will be condensed on them; but, if washed with whitening, no absorption will ensue; for chlorine does not displace carbonic acid from lime, nor does it combine with the calcareous carbonate.

We are thus clearly led to the conclusion that chlorine gas, when used as a disinfectant, should be considerably diluted with air before it is distributed into apartments, in

such a degree and manner as neither to injure furniture nor merchandize, nor materially to annoy respiration. We must throw out of view those constitutions indeed which are so delicate or fastidious as to be intolerant of even the smell of chlorine. The said aerial mixture should be introduced into the middle or upper regions, in preference to the lower, and its diffusion should be promoted by propulsion. Moist litmus paper, suspended in various parts of the chamber, will serve to show when the chlorine has done its duty.

The two figures which accompany this paper exhibit two forms of apparatus for disengaging chlorine in regulated quantities, for mixing it with air in any proportion, for blowing it into any infected space, and for ascertaining the degree of its dilution at any stage of the operation. One of them has been constructed in the Dockyard at Woolwich, by order of Sir T. Byam Martin, Comptroller of the Navy, from a drawing furnished by me, the copy of that laid before the Board of Health on the 22nd of June. The object of this construction is to show how the cargo of a ship may be imbued with dilute chlorine, without injuring its quality or disturbing its position. Such an easy, quick, and safe immersion in this expurgative gaseous medium will, I presume, be deemed by all persons acquainted with the affinities of this most energetic element, to be a surer safeguard against the importation of contagion in merchandize, than the mere exposure of the goods to the air, as practised under the actual laws of quarantine. At the present crisis of the Russian cholera, the cargoes of hemp, wool, hides, &c., now in the course of arrival on the British shores from the Baltic, and immediately placed

under quarantine, are so immense as to require, it has been said on official authority, the decks of ninety-five line of battle-ships for their adequate exposure. Supposing infectious fomes to exist in the merchandize, and the quarantine laws act solely on that presumption, what a formidable mass of contagion will be let loose in our atmosphere, and what a cruel duty is imposed on the sailors immured in the pestilential focus ! It appears to me that the danger, expense, trouble, and delay of quarantine, may be saved by a just application of the antiloimic virtues of chlorine.

This apparatus may easily be got up by any ship carpenter, in a day or two, with a couple of casks, one small and the other large, which has been actually done at Woolwich.

With the other apparatus, chlorine may be readily propelled in any state of dilution, in any quantity, and in any direction, through apartments of any kind. Such an effective application of this antiputrescent antiloimic element will infallibly exercise an expurgatory influence, no less sweetening to the senses, than salubrious to the system ; and ought to banish forever the sham or misdirected agency of chloride of lime or chlorine, with which medical men have so often deceived themselves and the public.* Wherever chlorine has failed to extinguish infectious fomes, the operator, and not the chemical agent itself, has been in fault. Let us suppose, for example, that the fetid air of a dissecting room is to be sweetened ; and that this is attempted by setting on the table or

floor a few saucers filled with chloride of lime. If the air remain fetid, is chlorine to be deemed inert and inefficacious ? No, surely ; for the operation was unskilfully performed. Thus also a small portion of chlorine, liberated on the floor of an apartment containing beds and furniture, may never rise in adequate force to the line of the walls where contagious virus may lurk. This remark is peculiarly applicable to the less fugacious infections, as the variolous, which require an energetic dose of chlorine. In fine, one rule may serve for the bleacher and disinfecter by this element ; that is, to employ it in doses proportional to the stubbornness of the coloring or morbid matter.

The distribution of dilute chlorine through the cargo of a ship, and the due impregnation of the interior of the bales, may be easily accomplished by the above-described apparatus.

Tubes of lead, leather, or the water-proof double cloth, are to be let down a few feet into the hold, under the main hatchway, so that by the action of the apparatus the disinfected air may be driven through every interstice, till they envelope every package. The quantity of chlorine, and the continuance of the operation, must be regulated by the capacity of the ship, and the nature of the bales ; but in general a couple of hours will suffice. All the openings in the deck should be carefully closed, except a small one near the stem and another near the stern, to permit the discharge of the atmospheric air and the ready circulation of the disinfecting gas. Eventually, traces of chlorine issuing from these openings will be observed by the smell or by the white cloud sur-

* Mr. Faraday's elaborate fumigations of the Milbank Penitentiary do not fall under this censure.

rounding a feather moistened with water of ammonia (spirits of harts-horn). The process may now be regarded as complete; and after the interval of a few hours, all the hatchways and windows may be thrown open, and a free ventilation given to the ship. The residuary chlorine in its discharge into the air being wafted round the bodies of the sailors, will disinfect their dress, and give final security against the importation of contagious fomes.

An apartment may be conveniently disinfected by placing on a shelf or support near the ceiling a small basin or pipkin, containing chloride of lime, having set over it a glass or earthenware funnel with muriatic acid diluted with about its weight of water; the beak of the funnel being partially closed with a cork, so that the acid may drop slowly down on the chloride. Eight ounces of good chloride thus treated with ten ounces of muriatic acid, will suffice to fumigate and sweeten the air of a common-sized chamber.

After the preceding observations, it will not be expected that I should ransack medical repositories, in proof of the antiloimic powers of chlorine. But less fallacious evidence may be found. In the neighborhood of the city of Glasgow, there are several large factories, the atmosphere of certain parts of which has been for a long series of years more or less impregnated with chlorine; I allude particularly to the chemical works of Messrs. Tennant, at St. Rollox, to those of Messrs. White, at Shawfield, and to Messieurs Monteith's calico-print field, at Barrowfield. In the last-mentioned establishment, a great many tons of chloride of lime were for many years treated every week with sul-

phuric acid, in order to obtain a strong aqueous solution of chlorine. When the sulphuric acid was poured into the clear watery solution of the chloride, contained in a large leaden cistern, a very considerable quantity of chlorine gas escaped into the air, which communicated its peculiar odor to the whole vicinity. Chlorine was also continually emitted from the above discharged liquor, in the course of its application to Turkey-red cloth, for producing the white figures of Bandana calicoes. Mr. George Rogers, the very intelligent conductor of this magnificent establishment, has just favored me with the following letter relative to the anti-contagious influence of chlorine.

"My dear Sir,—In answer to yours of the 24th, I have long been convinced of the efficacy of chlorine in purifying contaminated or foul air, and in arresting the progress of contagious diseases, more particularly typhus. During the long period of thirty years that I have conducted this establishment, with a population of two or three thousand, including their families, I am not aware of a single case that could be classed as contagious; and in many hundred cases in which I have recommended chlorine in the village (Barrowfield), its good effects have been apparent in arresting the progress of typhus and other fevers.—I am, my dear Sir,

"With much respect, yours,
(Signed) "GEORGE ROGERS."
"Dunoon, 31st June, 1831."

Mr. White, who has given up making chloride of lime for a good many years, and who has no interest in the sale of the article, writes me, 26th June, 1831, as follows :—

"All that I can state is merely the impression among our workmen, of their total immunity from fever;—and this impression is justified by the circumstance, that while typhus was prevalent in the neighborhood, none of the workmen employed in the manufacture of chloride of lime were ever its victims.

(Signed) "JOHN WHITE."

As Messrs. Tennant, the original patentees of chloride of lime, are also the greatest manufacturers of it in the world, their testimony might be received as that of interested persons. But the following document from Dr. Corkindale, physician to the gaol of Glasgow, and celebrated for his skill in medical jurisprudence, is above any such suspicion.

"Glasgow, 1st July, 1831.

"In the year 1824, a suit was brought against Mr. Tennant's chemical works at St. Rollox, on the score of nuisance, proceeding on the allegation that the fumes arising from the processes there carried on were injurious to the health of the neighborhood. Around the works there are houses for the accommodation of about twelve families of the workmen. These persons have continued to reside there for various periods from two to twenty years. I examined the condition of these people, and made inquiries as to the history of their health during their residence, as detailed by themselves. I found that their condition, in this respect, was nearly the same as other persons of the same rank of life, in ordinary situations; but it was the uniform statement of the whole of them, that *no person residing on these premises had been affected with typhus*

at the different periods when that epidemic was very prevalent in Glasgow. It was evident from inspection that this immunity was not owing to superior cleanliness and ventilation, for the apartments were as dirty and crowded as the ordinary habitations, where I know typhus had prevailed. The vapors from the works were various, but by far the most prominent was chlorine, rising both from the preparation of the chloride of lime, and from the treatment of the residuum for the manufacture of soda.

(Signed)

"J. CORKINDALE, M.D. LL.D."

I have been favored by M. d'Epinay, agent of the island of Mauritius to the British government, with an excellent account of the introduction into that island of the Oriental cholera, which, having recently transmigrated the middle of Asia and the north of Europe, now desolates the western provinces of Russia, and hovers like an incubus over our shores. The facts it relates will be found interesting and instructive in no ordinary degree.

"London, June 25, 1831.

"My dear Sir,—I proceed to perform the promise I this day made of furnishing you with some details concerning the introduction of the cholera morbus into the Island of Mauritius. This disease was imported there by the British frigate, the *Topaz*, commanded by Captain Dumbly. It is in its nature eminently contagious; and although this opinion exposed the colony to which I belong to the most violent calumnies on the part of its Governor, General Darling, and to the anger of Lord Bathurst, then Secretary of State for the Colonies, I must persist in maintaining it, be-

cause it is proved by the facts about to be related.

"The *Topaz* arrived at Mauritius the 28th of December, 1819, having just come from Ceylon, where the cholera prevailed. This fact is notorious, and is indeed fully verified by the following extract from the *Asiatic Mirror*, published at Calcutta, the 24th of December, 1819.

" 'We announce with regret that the news brought from Ceylon are very distressing. Fevers, dysentery, and the cholera morbus, are spreading in an alarming manner. The 7th regiment, and a detachment of the 45th, which have been in the island only for a week, have suffered considerably; thirteen officers of the former, and thirty soldiers of the latter, having fallen victims to this terrible scourge.'

"The report of the physicians who visited the frigate on its arrival, stated, 'that the dysentery and the cholera morbus prevailed on board of it.'

"Notwithstanding this, the Physician-General of the Forces in Mauritius, and the Governor, had the culpable weakness to permit communication between the frigate and the shore. The rumor being universally spread that several men of the frigate were ill of the cholera; the representation of the Colonel of a regiment, who opposed the patients of the vessel being carried to the Military Hospital; tents mounted to receive them in the *Ile aux Tonneliers*; were circumstances which caused uneasiness: and the members of the *commune* (parish) imparted their feelings to the Governor, who gave for answer, 'that he was very sorry for them, but that he was ignorant of the laws of

the colony;' an ignorance supposable enough in a military man, but not the less reprehensible in a Governor.

"On the 5th of November, he wrote to the *commune*, to inform them that the *Journal* of the following day would contain an opinion from the Physician-General, which would render useless every other measure relative to the disease which *had prevailed* on board of the *Topaz*.

"On the 19th of November, two negroes fell down in the street, and died before there was time to assist them; and the disease began to spread through the town. On the 23d, the frigate brought-to, and visited a boat from the shore, as it came out of the harbor, on its way to the river *Rempart*. The crew of this boat were soon thereafter attacked with the cholera, which they communicated to the establishment of M. Carcenau, their master, who lost forty slaves, and died himself of the same disease. This was the first plantation where the cholera showed itself, although it was six leagues from the town. It soon made the tour of the Island, terrible in its first ravages, but becoming milder by degrees; more fatal in the neighborhood of the sea, and unknown in elevated regions.

"The communications with the Island of Bourbon, thirty leagues from Mauritius, being open, the disease was not long in being carried thither. The inhabitants, taking alarm, formed immediately a *cordon* round the town of St. Denys, and the punishment of death was decreed against all who should dare to break through it. This scourge did not extend beyond the limits which wise and courageous men had here traced around it.

"Very different was the case at Madagascar, into which the cholera was imported from Mauritius, and exercised the greatest ravages.

"It was computed that, in our island, the number of its victims amounted to a tenth of the population; and I concur in this estimate. It was chiefly among the lower classes, and persons given to intemperance, that the cholera was most fatal.

"A healthy regimen, great cleanliness, exercise, recreation, and courage, were found to be the best preservatives against its attack. Individuals who wore flannel generally escaped. The most successful remedy was saline purgatives, repeated in half-ounce doses every quarter of an hour, till the alvine discharge assumed a natural color.

"I could enter into other details which go to fortify the opinion I have always entertained of the contagious nature of cholera; but I think those I have adduced, and particularly what happened at Bourbon, ought to convince you that too many precautions cannot be taken against permitting communications with vessels coming from districts infected with the malady. Believe me to be, my dear Sir,

"Your devoted Servant,

(Signed) "AND. D'EPINAY."

From the same.

"July 7th, 1831.

"I told you that, in the Isle of France, during the cholera, we employed as a disinfectant a mixture of oxide of manganese and muriatic acid. We provided small phials of it, which were carried about in all the infirmaries, and by the people who entered the hospitals. They were also carried about by the women and children; and it was remarked that none of those so

protected by the disinfecting phials were attacked with the disease. Was this from the virtue of the composition, or from the confidence inspired by it? I cannot answer these questions, but content myself with stating the fact.

(Signed) "AND. D'EPINAY."

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BOSTON, SEPTEMBER 27, 1831.

CHANGE OF COLOR IN LEAVES.

THE varied and beautiful hues assumed by the foliage at this season, form one of the most remarkable phenomena of the vegetable kingdom, and one which is well worthy of engaging the attention of every observer of nature. This change has been observed to take place with, or soon after the first appearance of frost, and to be rapidly followed by the loss of vitality, and the fall of the leaf. An ingenious author of our own country, the writer of the letters on the Eastern States, has remarked, that the colors assumed by the forests of New England are more brilliant than those presented by European trees, and he attributes this difference to the circumstance that changes of temperature in the autumn are more sudden with us, and that the early frosts attacking the trees, while still vigorous, and possessing an active circulation, produce a more striking and obvious change in their aspect.

However this may be, as respects the fact or the explanation, it is certain that all leaves which are annually shed put on before their fall one

or more of a series of colors different from that which they present during spring and summer. In some, the only color assumed is yellow, and this may be observed in the elms and horse-chesnuts, so common in our streets and public walks. In others, this change is succeeded by that to an orange, or a brilliant red; and it is these last which give to our eastern woods, in which the beech and maple abound, their most beautiful dyes. Now it is remarkable that these colors, in the order in which they succeed to each other, beginning with green, form, as far as they extend, precisely the series presented by the solar spectrum. This observation has suggested the idea, that the alteration in question was connected with chemical changes, and especially with a diminished power in the leaf of performing that respiration on which its vitality is known to depend. The development of this theory, however, requires the previous consideration of the question, how far the green color of leaves has been ascertained to depend on the influences to which it is subjected, from the surrounding atmosphere.

From the facts which are observed in respect to the respiration of leaves, it has been concluded that their predominant functions were those of taking from the atmosphere its carbonic acid, and returning to it the oxygen of this gas, retaining the carbon for its own use. The former of these has been supposed to be principally performed by the under surface of the leaf, and the latter by the opposite. In certain circum-

stances, indeed, as during the night, and in cloudy weather, the reverse process takes place, the leaves receiving oxygen, most of which they combine with a portion of their carbon to form an excretion. The first, however, is decidedly the leading function, and occasionally the process is carried on to such an extent, that from twelve square inches of leaf, ten inches of oxygen have been given off in a few minutes. It is in this way that the product of human respiration is appropriated to the use of vegetable existence, and the atmosphere re-supplied with its vital constituent. So true is this, that although oxygen may be generally obtained from a definite portion of air or water by means of leaves confined in them, yet it is essential to the success of the experiment, that carbonic acid should be present; if the air or water be pure, no oxygen is given out.

Two conditions, then, are necessary to the healthy state of the leaves. First, that they should be furnished by the atmosphere with carbonic acid; and secondly, that the most part of the oxygen inspired, whether pure or combined, should be again given out to the air. Now it is on the due regulation of the last circumstance, that the color of the leaf seems to depend. It has been fully demonstrated by experiments on the spectrum, that the proportion of oxygen increases as we approach to its red extremity, so that the violet ray is the least, and the red the most highly oxygenated. The medium, therefore, exists at the green ray; and hence, it seems not unrea-

sonable to conjecture, that the power of the leaf to reflect this color, results from the due balance of its chemical affinities, and that the change takes place only when this balance is disturbed.

Thus far, indeed, the supposition in question, has the air of a mere hypothesis, and it is easy to answer, that the coincidence between the color of the leaf and the position of the green ray may be only accidental. But when with this are compared the phenomena which attend the decay of these organs, the correspondence is at all events deserving of attention. The power of the leaf to give out oxygen, evidently depends on the presence of a stimulus; since it is only during sunshine that this phenomenon occurs. Under other circumstances, the amount of this element which is received is greater than that given out. If from any cause, then, the amount of stimulus afforded to the leaf be lessened, the consequence must be an accumulation of oxygen. Precisely the same effect will follow, the stimulus remaining the same, and the irritability of the organ diminishing; and this ought to take place during the failure of the leaf, whether occurring naturally from old age, or prematurely induced by cold.

This accumulation of oxygen, then, may naturally be supposed to manifest itself by a change of the green color to one more approaching the oxygenated extremity of the spectrum. Accordingly we find that the first change which takes place gives a yellow tint, the second an orange, and the continued operation of the

same cause produces the red. These changes will, on examination, be observed to take place principally on the upper surface of the leaf, the under retaining its green tint for a longer period; a circumstance in favor of the view here taken, inasmuch as the extraction of oxygen is supposed to take place principally from the upper surface, the under being more favorably situated for the reception of the acid.

It has been already remarked that the stimulus of light was necessary in order that leaves might give out oxygen, and that under this stimulus only, they appear capable of separating this gas from its previous combination with the carbonic acid. Now it is to be recollected that when plants are deprived of light they become etiolated, that is, assume a pale yellow color. That in this state, they are saturated with oxygen, is rendered probable by the saccharine taste which under these circumstances they acquire. They also give out no oxygen, but only carbonic acid water, saccharine matter and mucilage. On exposure to the light, they part with their superfluous oxygen and acquire a green color. On the other hand, it has been noticed that in plants exposed to undue stimulus, the green color of the leaves has been changed to a blueish tint.

As respects the trees whose foliage is permanent, and remains green for an indefinite period, there are two circumstances which deserve notice. In the first place, these leaves are entirely distinguished by their form from those which are deciduous, and probably owe to this something of

their strength and durability. Secondly, nearly if not quite all these evergreens secrete resin, a substance apparently capable of contributing very materially to the vitality of the foliage. In fact, the coloring matter of the leaf itself presents great analogy to a resin, particularly in the circumstance of being soluble in alcohol. It has been noticed that where other trees have been grafted with scions of these resinous plants, the graft has not only sustained the permanency of its own leaves, but has communicated its character in this respect to the remainder of the tree.

ANATOMICAL PREPARATIONS.

For many years past we have been in the habit of referring, when called on, by any particular case, to refresh our knowledge of anatomy, to that excellent cabinet of preparations possessed by the Society for Medical Improvement,—a society composed of intelligent and enterprising members of the profession, whose semi-monthly meetings are to all a source of pleasure, as well as of valuable knowledge. The anatomical cabinet, though good so far as it goes, is still small; and as such a collection is useful only for reference, our medical brethren in the city and vicinity would find it vastly for their advantage to add any such specimens as they may possess, to those already in the rooms of the Society. They would there be sure of careful usage, and such donors might, we doubt not, be allowed the privilege of consulting the whole collection at their pleasure. The difficulty of procuring a

suitable place for such specimens, in private houses, is one reason why the opportunities offered for preparing them, are not oftener improved. The plan we propose, by removing this obstacle, would be a means of increasing their number, as well as bringing them into such form as to be most directly and extensively useful.

The want of a good work, in this country, to direct the anatomist in the best and easiest modes of making his preparations, has been another reason of their comparative rarity. The art has undergone very great improvement even within the last ten years, and although the work of POLE is now and then to be found in the dissecting room, it is far from being common. Never having been republished in this country, it is obtained with difficulty, and at a considerable expense. Further than this, we apprehend our schools are destitute of any book which contains all necessary to be known in such cases. It is therefore with pleasure we have perused a new manual just from the pen of Usher Parsons, M.D. and published by Carey & Lea, of Philadelphia. The directions given by Dr. P. are formed on the basis of Pole, Marjolin, and Breschet, and include the new method of Mr. Swan. This work also contains such other directions as the patient research and long experience of a practical anatomist have induced him to believe will be most useful to the student. It will not only instruct him in the best methods of making all kinds of preparations and models, in wax and plaster, of the different

parts and organs of the body, but also respecting other important points,—such as the comparative advantages of the different seasons of the year; the diseases apt to be contracted in the dissecting room, with the most successful modes of treating them; choice of subjects; order of examination, &c. On the whole, it is compiled and prepared with judgment, and is the best and most economical companion the student can possess to aid him in the pursuit of this department of his labors.

We ought not to omit noticing—what will be apparent to every reader of this work—the great number of its typographical errors. The sheets could hardly have received the revision of a medical man. These errors, however, which occur mostly in technical terms, will be apparent to any one at all conversant with them, and we trust will be corrected in future editions. The plates appended to the work give a good representation of the different instruments required in making preparations, and the mode of using them.

PATHOLOGICAL WALTZ.

DR. JOHNSON has not failed to notice a case recently published, which is admirably adapted to his favorite style of criticism.

Dr. Corrigan, says he, Dr. Hope, and many others, will be delighted to learn that Dr. David Badham has set to music the discordant sounds of a diseased heart, and has thus drawn harmony out of hypertrophy, with more than Paganini's skill. The bars, crotchets, quavers, and demi-quavers are tunelessly arranged in the pages of an esteemed contemporary,

and form one of the greatest curiosities in morbid anatomy which we have ever witnessed. The case was that of a young woman who was treated in the wards of the Royal Infirmary of Glasgow, for pleurisy, and was "completely recovered," and about to be discharged, when it was discovered that her recovery was very far indeed from being so complete. Her respiration was never perfectly easy, and she was put out of breath by the slightest exertion. Her pulse was very uncertain as to frequency, varying from 45 to 115 in the minute. But the following very curious results of various examinations gave origin to the musical, and we would say, very fanciful illustration, to which we have just adverted.

1. Pulsation of the heart heard over the whole chest, or nearly so.

2. The heart's impulse on the right side exaggerated, but slightly; neither the first nor second sound, however, so clear as on the opposite side, where,

3. The former is far louder than natural, but the shock less than over the right cardiac region.

4. The first sound concomitant with the heart's impulse is preternaturally loud on both sides, more particularly on the left, where it resembles the sound commonly produced by the auricles.

5. The rhythm of the heart has been for the last week or ten days altogether extraordinary, and to this fact my attention has been particularly drawn; the first sound, with its concomitant impulse, having been as usual followed immediately by a second; this was in its turn as immediately succeeded by a third, or, to speak more correctly, by a reduplication of the second. These three sounds together form an exact *waltz* measure, after which comes a pause of much longer than natural persistence. On some occasions the auricle (to which I have little hesitation in referring the second sound of

the heart, although at variance, perhaps, with the prevailing opinion) has contracted not only twice, but sometimes thrice, or even four times, for each pulsation of the ventricle; and what is very remarkable, since contractions of the auricles are seldom communicated to the sense of touch, distinct beats exactly synchronous with these sounds are to be ascertained, whatever number of times the sounds are repeated. In short, if the ventricles in this case occupied the same time in contracting as they do in health, and the pause were of natural persistence, the rhythm of

the heart might be represented in musical notation, as follows:—

[Here follows the music, which we had not time to represent by wood-cuts, and for the omission of which we shall doubtless be pardoned by the reader.]

Whole number of deaths in Boston the week ending Sept. 16, 24. Males, 15—Females, 9. Stillborn, 1.

Of typhous fever, 1—dysentery, 3—dropsy on the brain, 1—infantile, 3—consumption, 1—old age, 1—cholera infantum, 3—canker, 1—teething, 1—swallowing a bean, 1—unknown, 3—suicide, 1—inflammation in the bowels, 1—asthma, 1—disease of the bowels, 1—fits, 1—debility, 1.

ADVERTISEMENTS.

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Published in New York, by the former Editor of Zion's Herald and Christian Advocate and Journal. Devoted to the interests of Religion, Literature, Science, Agriculture, Commerce, and Public Occurrences.

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It is believed that a large portion of the American community are prepared, by the prevalence of urbane and charitable sentiments between the various religious denominations, to appreciate and sustain a publication, which, while its chief aim in its religious departments shall be the glory of God and the promotion of the best interests of mankind, will render equal justice to all, and engage in controversy with none.

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